

138 the energy accumulated in the storage capacitor (C2) which is charged directly from
139 the solar module (SM1) through the second blocking diode (D2). By having a storage
140 capacitor charged at a higher voltage more usable energy is stored for transferring to
141 the low voltage capacitor (C3) by the switcher regulator (VR1). It is to be noted that
142 the switcher regulator (VR1) will not run continuously but it will run and stop as per a
143 control signal from the electronic logic circuit (2). In this alternative design the logic
144 control circuit will be frequently monitoring the voltage on the low voltage capacitor
145 (C3) and will command the switcher to run and transfer energy from the storage
146 capacitor (C2) when the voltage is approaching a low limit (i.e. 3VDC) and stop once
147 the voltage reaches a high limit (i.e. 4 VDC).

148 Fig. 3 also shows a second voltage regulator (VR2) connected directly to the
149 solar module and feeding the low voltage capacitor (C3). The function of this circuit is
150 to have the system started when the unit has been stored for a long time and the
151 charge in the capacitors has been completely depleted. In this case the second
152 voltage regulator (VR2) will provide power to activate the electronic logic (2).

153 Although only an exemplary embodiment of the invention has been described in
154 the detailed description above, those skilled in the art will readily appreciate that many
155 modifications are possible without materially departing from the novel teachings of this
156 invention. Accordingly, all such modifications are intended to be included within the
157 scope of this invention as defined in the following claims.

158 CLAIMS

159 1. A self-contained electronic pressure monitoring and shutdown device
160 comprising:

161 a switch-gauge with adjustable high and low pressure electrical contacts to
162 switch an electrical signal corresponding to the respective high and low
163 pressure alarm condition;

164 a pulse driven solenoid valve;

165 a high pressure indicator lamp;

- 166 a low pressure indicator lamp;
- 167 a low battery indicator lamp;
- 168 a system OK indicator lamp;
- 169 a "Test" manually activated electrical contact;
- 170 a "Reset" manually activated electrical contact;
- 171 a battery powered power module that supplies two separate voltages for
- 172 providing independent power sources to the electronic logic circuit and the
- 173 solenoid valve driver circuits;
- 174 an electronic logic circuit electrically coupled to the switch-gauge, pulse driven
- 175 solenoid valve, indicator lamps and manually activated electrical contacts
- 176 wherein the electronic logic circuit provides the following logic functions:
- 177 generates one or more consecutive shutdown pulses to trip the solenoid
- 178 valve and flashes the high pressure alarm lamp when a high pressure
- 179 condition is detected by the switch-gauge and confirmed by re-reading
- 180 the alarm signal for about one second;
- 181 generates one or more consecutive shutdown pulses to trip the solenoid
- 182 valve and flashes the low pressure alarm lamp when a low pressure
- 183 condition is detected by the switch-gauge and confirmed by re-reading
- 184 the alarm signal for about one second;
- 185 latches the last cause of shutdown and maintains the corresponding
- 186 alarm lamp flashing even if the cause for the shutdown is no longer
- 187 present or a different alarm is detected after the shutdown;
- 188 when the "Reset" manually activated electrical contact is actuated by the
- 189 operator it stops flashing the alarm lamps, generates one or more pulses
- 190 to open the solenoid valve and ignores existing high and low pressure

191 alarms for a preprogrammed number of minutes to allow the process to
192 reach normal pressure;

193 flashes the system OK lamp every one or two seconds when no alarms
194 have been detected since the last "Reset";

195 periodically reads the voltages supplied by the power module to confirm
196 power supply is providing proper voltage;

197 flashes the low battery voltage lamp when one of the voltages from the
198 power module falls below pre-programmed normal but not low enough to
199 compromise reliable operation.

200 generates one or more consecutive shutdown pulses to trip the solenoid
201 valve and flashes the low battery voltage alarm lamp when one of the
202 voltages from the power module falls below a preprogrammed "low-low"
203 voltage;

204 maintains memory of the last cause of shutdown after the system has
205 been reset;

206 when the "Test" manually activated electrical contact is actuated by the
207 operator it flashes the lamp corresponding to the last cause of shutdown
208 for a few seconds and then flashes each alarm lamp to confirm they are
209 in good working order.

210 2. The self-contained electronic pressure monitoring and shutdown device of
211 claim 1 wherein the high voltage provided by the power module is connected in
212 parallel with a capacitor of at least 1,000 uF for boosting pulse current capacity.

213 3. The self-contained electronic pressure monitoring and shutdown device of
214 claims 1 and 2 wherein the electronic logic circuit has the means to be
215 configured in such a way that it will delay the alarm and shutdown on the high
216 and/or low pressure alarms for a preprogrammed number of seconds to prevent
217 shutting down the process if the alarm is only temporary.

218 4. A self-contained electronic pressure monitoring and shutdown device
219 comprising:

220 a switch-gauge with adjustable high and low pressure electrical contacts to
221 switch an electrical signal corresponding to the respective high and low
222 pressure alarm condition;

223 a pulse driven solenoid valve;

224 a high pressure indicator lamp;

225 a low pressure indicator lamp;

226 a low battery indicator lamp;

227 a system OK indicator lamp;

228 a "Test" manually activated electrical contact;

229 a "Reset" manually activated electrical contact;

230 a solar powered power module that stores energy in capacitors, sized to store
231 enough energy to keep the device in operation throughout the night or longer;

232 an electronic logic circuit electrically coupled to the switch-gauge, pulse driven
233 solenoid valve, indicator lamps and manually activated electrical contacts
234 wherein the electronic logic circuit provides the following logic functions:

235 generates one or more consecutive shutdown pulses to trip the solenoid
236 valve and flashes the high pressure alarm lamp when a high pressure
237 condition is detected by the switch-gauge and confirmed by re-reading
238 the alarm signal for about one second;

239 generates one or more consecutive shutdown pulses to trip the solenoid
240 valve and flashes the low pressure alarm lamp when a low pressure

241 condition is detected by the switch-gauge and confirmed by re-reading
242 the alarm signal for about one second;

243 latches the last cause of shutdown and maintains the corresponding
244 alarm lamp flashing even if the cause for the shutdown is no longer
245 present or a different alarm is detected after the shutdown;

246 when the "Reset" manually activated electrical contact is actuated by the
247 operator it stops flashing the alarm lamps, generates one or more pulses
248 to open the solenoid valve and ignores existing high and low pressure
249 alarms for a preprogrammed number of minutes to allow the process to
250 reach normal pressure;

251 flashes the system OK lamp every one or two seconds when no alarms
252 have been detected since the last "Reset";

253 periodically reads the voltages of the main capacitors of the power
254 module and controls an output signal to activate a switcher voltage
255 regulator that transfers energy from a high voltage storage capacitor to a
256 low voltage capacitor so the low voltage is kept within a range that
257 insures the reliable operation of the electronic logic module;

258 generates one or more consecutive shutdown pulses to trip the solenoid
259 valve when any of the main capacitors reaches below a preprogrammed
260 "low-low" voltage;

261 maintains memory of the last cause of shutdown after the system has
262 been reset;

263 when the "Test" manually activated electrical contact is actuated by the
264 operator, it flashes the lamp corresponding to the last cause of shutdown
265 for a few seconds and then flashes each alarm lamp to confirm they are
266 in good working order.